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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/826,602	04/16/2004	Yee-Chia Yeo	TSM03-0847	1196

43859 7590 02/11/2009

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EXAMINER	
RAYMOND, BRITTANY L	

ART UNIT	PAPER NUMBER
1795	

MAIL DATE	DELIVERY MODE
02/11/2009	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/826,602	YEO ET AL.	
	Examiner	Art Unit	
	BRITTANY RAYMOND	1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *24 November 2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *23-34,37-54,56 and 58-65* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *23-34 and 37-54* is/are allowed.

6)☒ Claim(s) *56 and 58-65* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *29 July 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *11/24/2008*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

2. Claims 56 and 58-61 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chang (U.S. Patent Publication 2005/0123863) in view of Din (U.S. Patent Publication 2002/0039704).

Chang discloses an immersion lithography process comprising: providing a material layer, forming a photoresist layer on the material layer, forming a protective layer on the photoresist layer, performing an immersion exposure step to pattern the photoresist layer, developing the photoresist layer, and performing an etching or an ion implantation process to process the material layer by using the photoresist layer as a mask (Paragraphs 0020-0023 and 0027-0028), as recited in claim 61 of the present

invention.

Chang fails to disclose that the upper portion of the photoresist layer is converted into a treated layer, and that the treatment is a plasma treatment, a chemical treatment, an ion implantation process or a thermal treatment.

Din discloses a process of hardening a photoresist during a reactive ion etching process (Paragraph 0014). It is inherent that a reactive ion etching uses chemically reactive plasma, which leads to a plasma and chemical treatment being performed, as recited in claims 56 and 58 of the present invention. Din also discloses that a hard bake and ion implantation can be used to harden the photoresist (Paragraph 0006), as recited in claims 59 and 60 of the present invention.

It would have been obvious to one of ordinary skill in this art, at the time of invention by applicant, to have a plasma treatment, a chemical treatment, an ion implantation process or a thermal treatment, as suggested by Din, to form a treated layer on a photoresist for the immersion lithography process of Chang because Din teaches that the hardening of the photoresist protects it from being altered during subsequent processing, similar to the protective layer of Chang.

3. Claim 64 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chang (U.S. Patent Publication 2005/0123863) in view of Din (U.S. Patent Publication 2002/0039704) as applied to claims 56 and 58-61 above, and further in view of Meagley (U.S. Patent Publication 2005/0084794).

The teachings of Chang and Din have been discussed in paragraph 2 above.

Chang and Din fail to disclose that a chemically amplified photoresist is used.

Meagley discloses an immersion lithography process comprising: providing a substrate with a photoresist layer, placing an index-matching liquid between the photoresist and a last lens for illuminating the photoresist, and incorporating additives into the photoresist to promote diffusion of the photoresist into the index-matching liquid in order for the photoresist to patterned more effectively (Paragraph 0037). Meagley also discloses that chemically amplified photoresists are often used in this process (Paragraph 0020), as recited in claim 64 of the present invention.

It would have been obvious to one of ordinary skill in this art, at the time of invention by applicant, to have used a chemically amplified resist, as suggested by Meagley, in the process of Chang and Din because Meagley teaches that chemically amplified photoresists work well in immersion lithography processes.

4. Claims 62, 63 and 65 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chang (U.S. Patent Publication 2005/0123863) in view of Din (U.S. Patent Publication 2002/0039704) as applied to claims 56 and 58-61 above, and further in view of Hirayama (U.S. Patent Publication 2006/0141400)

The teachings of Chang and Din have been discussed in paragraph 2 above.

Chang and Din fail to disclose that the immersion fluid comprises water, that the light has a wavelength of less than 450 nm, and that the photoresist layer is developed in tetramethylammonia hydroxide.

Hirayama ('400) discloses an immersion exposure process comprising: applying a resist composition onto a substrate (Paragraph 0137), immersing the substrate in a refractive index liquid and exposing the substrate with light through a mask pattern and

the liquid to reach the resist layer (Paragraphs 0141 and 0142), as recited in claim 61 of the present invention. Hirayama also discloses that the refractive index liquid can include water (Paragraph 0145), as recited in claim 62 of the present invention. Hirayama states that the light used in the exposure can be an ArF excimer laser, a KrF excimer laser, an F_2 excimer laser, etc. (Paragraph 0144), which is known by one of ordinary skill in this art to have a wavelength of less than 450 nm, as recited in claim 63 of the present invention. Hirayama also states that the exposed resist film can be developed using an alkaline developer solution (Paragraph 0148). Example 1 discloses that the developer can be tetramethylammonium hydroxide (Paragraph 0160), as recited in claim 65 of the present invention.

It would have been obvious to one of ordinary skill in this art, at the time of invention by applicant, to have used water as an immersion fluid, light having a wavelength of less than 450 nm, and tetramethylammonia hydroxide as a developer, as suggested by Hirayama, in the process of Chang and Din because Hirayama teaches that these are all common practices in immersion lithography.

Allowable Subject Matter

5. Claims 23-34 and 37-54 are allowed.

6. The following is a statement of reasons for the indication of allowable subject matter: The prior art references do not teach or suggest allowing an immersion fluid to diffuse substantially or completely into a photoresist layer prior to exposure of the photoresist by immersion lithography.

Response to Arguments

7. Applicant's arguments, filed 11/24/2008, with respect to the rejection(s) of claim(s) 23-34 and 37-54 have been fully considered and are persuasive. More specifically, the reference, Meagley, teaches out-diffusion of the photoresist into the immersion fluid rather than diffusion of the immersion fluid into the photoresist. Therefore, the rejection has been withdrawn and the claims are allowed.

8. Applicant's arguments filed 11/24/2008, with respect to the rejection(s) to claim(s) 56 and 58-65 have been fully considered but they are not persuasive.

Applicant argues that Din fails to disclose converting only an upper portion of the photoresist layer into a treated layer prior to patterning the photoresist layer. Din is combined with Chang only to teach that a plasma treatment, a chemical treatment, an ion implantation process or a thermal treatment can be used to form a protective layer on the surface of a photoresist layer. Since Chang teaches the importance of placing a protective layer on a photoresist prior to performing an immersion exposure on the photoresist, it would be obvious to be able to use the techniques of Din in order to harden the surface of the photoresist and create this protective layer.

Conclusion

9. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not

mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to BRITTANY RAYMOND whose telephone number is (571)272-6545. The examiner can normally be reached on Monday through Friday, 8:30 a.m. - 5:00 p.m. EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Huff can be reached on 571-272-1385. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Kathleen Duda/
Primary Examiner, Art Unit 1795

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